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PRE-APPEAL BRIEF REQUEST FOR REVIEW	Docket Number (Optional) YOR920030532S1	
	Application Number 10/735,845-Conf. #3180	Filed December 16, 2003
	First Named Inventor Keith Kwong Hon Wong et al.	
	Art Unit 2822	Examiner T. Y. Tran

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).
Note: No more than five (5) pages may be provided.

I am the

- [ ] applicant /inventor.
- [ ] assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)
- [ ] attorney or agent of record. Registration number _____
- [x] attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34. 44,522

Signature

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Typed or printed name

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5-5-06
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

- [ ] *Total of 1 forms are submitted.

PAGE 5/9 * RCVD AT 5/5/2006 3:18:32 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/37 * DNIS:2738300 * CSID:202 293 6229 * DURATION (mm-ss):02-12

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Docket No.: 20140-00314-US
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Kwong-Hon Wong et al.

Application No.: 10/735,845 Confirmation No.: 3180

Filed: December 16, 2003 Art Unit: 2822

For: INTERCONNECT STRUCTURES AND METHODS OF MAKING THEREOF Examiner: T. Y. Tran

PRE-APPEAL BRIEF REQUEST FOR REVIEW

ISSUE **Whether claims 1, 3, 4, 6, 7, 9, 10, 11, 24-26 and 28 are anticipated by Cooney (2004/0152295)?**

The rejection is based entirely on the examiner's position that the "second liner layer 9", as described in Cooney corresponds to the term "interconnect copper line" in the claims. Applicants respectfully submit that the examiner's position is incorrect, and therefore the rejection is improper.

Arguments in support of Applicants' position are provided in the Amendment After-Final dated January 17, 2006, pages 5 and 6. A similar argument follows.

DISCUSSION

Cooney describes conventional copper conductor lines embedded in a dielectric material, i.e., a via with the stated improvement in barrier or liner structure (see, paragraphs 0004 and 0008). Cooney goes on to emphasize the "need in the industry for an improved liner structure, particularly for copper metallurgical structures". See, paragraph 0009. Thus, Cooney describes the containment of a copper conductor line within an improved liner structure. More importantly, the improved liner structure, which includes a "second liner layer 9" is not a conducting material. There is certainly no disclosure in Cooney that the second liner layer 9 is a copper conductor material.

Cooney describes the improved liner structure as having a first liner layer 6, which protects the via sidewalls from erosion during processing, and a second liner layer 9, which increases the contact area of the underlying metallization. See, paragraphs 0009-10; and 0022-024. Once the two barrier liners are deposited in the dielectric trench and the excess barrier material removed by a CMP process, "a conductive material 10 is deposited as to fill the via 5". Paragraph 0025. "Preferably, the conductive material 10 comprises copper." Paragraph 0026.

The stated copper metallurgical structures referred to in Cooney corresponds to the term "interconnect copper line" in applicants' claims. In support of applicants' position that the "second liner layer 9" is not the claimed "interconnect copper line", one need only look to the disclosure of Cooney itself. In fact, the title alone, "Sacrificial Metal Liner For Copper" makes this distinction. In paragraph 10, and throughout Cooney, other distinctions are made between copper interconnect lines and a liner structure.

> Further, during sputter etching or cleaning, the *first liner layer is removed* from the via bottom, *to avoid interconnect contamination* during processing and to further enhance reliability. ... *The liner structure also improves stress migration* characteristics, which are particularly problematic *in copper interconnects*. Para. [0010]
>
> Next, a second liner layer 9 is deposited, generally conformally, over the dielectric layer 4 and in the via 5, on the first liner layer 6 left on the via sidewalls 7 and on the extended portions of the sidewalls 7 and the bottom 8 penetrating the metal line 2, as shown in FIG. 1E. The second liner layer 9 preferably comprises a refractory metal or a compound thereof, more preferably, tantalum, tantalum nitride, titanium, titanium nitride, a titanium-tungsten alloy or a combination thereof. ... Referring to FIG. 1F, *after removal of the second liner layer 9* from the dielectric layer 4, such as by CMP, *a conductive material 10 deposited*, as to fill the via 5, as well as coating the top surface of the dielectric layer 4. Para. [0024-25]

Given the above disclosure there can be no question that Cooney informs one of ordinary skill that the conductive material 10 refers to an interconnect copper line as claimed, and not the second liner layer 9 as relied upon in the rejection. Yet, in spite of these very clear teachings of Cooney as to what is a conductor line 10, preferably a

copper conductor line, and what is a second barrier layer 9, preferably a refractory metal, it is the examiner's position that the second barrier layer 9 is a copper interconnect line as claimed. The examiner's position finds no support in Cooney.

Cooney makes a clear distinction between what is a copper conductor line and what is a barrier layer. Applicants' claims make this very same distinction. Therefore, if the rejection is based upon the teachings of Cooney, the rejection should at the very least rely upon conductor material 10 in Cooney as the corresponding structure to the claimed copper interconnect line. The disclosure of a reference must be viewed in its entirety as to what it teaches to one of ordinary skill in the art, and what Cooney teaches is that a barrier liner is something quite different than a copper conductor or copper interconnect line.

The examiner is also incorrect in taking the position that there is some teaching in Cooney of a "layer structure comprising liner layer which is made of copper metallurgy". See, Final Rejection, page 3, line 12-15; and page 4, lines 15-19. Applicants understand this statement to mean that there is some description in Cooney that the "second liner layer 9" comprises copper. Applicants submit that there is no such description in Cooney. Cooney does, however, inform one of ordinary skill that these liner materials typically comprise refractory metals such as tantalum, titanium and tungsten.

Like the interconnect structures described in Cooney, the interconnect structures described by applicants can contain one or more barrier layers "between the dielectric material and the conductive material in order to prevent atoms of the conductive material from diffusing into and at times through the dielectric material." The presence of the barrier layers minimize inter-level or intra-level shorts and junction leakage. Application, page 2, lines 4-10. "As a result, if copper is used as an interconnect structure, the copper needs to be confined with a barrier layer." Application, page 2, lines 15-16. The application further describes the process steps commonly used to provide a copper interconnect line. See, Figs. 1A to 1C, which show a trench 14, via 15, copper line 12, and barrier layer 16. A copper plating process is then used to fill the trench thereby forming another interconnect copper line. Application, page 2, lines 17-29.

In summary, the rejection improperly points to the "second liner layer 9 as the claimed "interconnect copper line". One of ordinary skill in the art with the knowledge provided by Cooney and from reading the entirety of the application would no doubt differentiate between an interconnect copper line and a barrier layer in a semiconductor structure.

The rejections of selected claims under 35 USC 103 as unpatentable over Cooney in view of the listed secondary references is respectively traversed as the secondary references do not overcome the stated deficiency in Cooney.

For the reasons stated, applicants respectfully request that the Pre-Appeal Review Panel conclude that the rejection is improper, and the rejection be withdrawn.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 50-0510, under Order No. 20140-00314-US from which the undersigned is authorized to draw.

Dated: 5-5-06

Respectfully submitted,

By _____

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